Date: Subject: S.01

$$a = \frac{dv}{dt}$$

$a =$ متغيرة	$a = const$	$a = 0 = \frac{dv}{dt}$
	$V = V_0 + at$	$\boxed{V = \frac{X}{t}}$
	$X - X_0 = V_0 t + \frac{1}{2} a t^2$	
	$V^2 = V_0^2 + 2a(X - X_0)$	$V = const$

$$a = \frac{dv}{dt}$$

$$\int dv = \int a\, dt$$

$$V = at + C$$

$$t = 0,\ V = V_0,\ X = X_0$$

$$C = V_0$$

$$\boxed{V = V_0 + at}$$

$$V = \frac{dX}{dt}$$

$$V_0 + at = \frac{dX}{dt}$$

$$\int dX = \int (V_0 + at)\, dt$$

$$\boxed{X = V_0 t + \frac{1}{2} a t^2}$$

$$a = \frac{dv}{dt} \cdot \frac{dX}{dX}$$

$$a = V \cdot \frac{dv}{dX}$$

$$\int a\, dX = \int v\, dv$$

$$V^2 = aX + C$$

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EX 2 :-

$f = (8t - 5)\ m/s^2$

$X_0 = 2\ m \qquad V_0 = 12\ m/s \qquad V, X\ ? \rightarrow 10\ Sec$

Sol,

$f = \frac{dv}{dt}$

$\frac{dv}{dt} = 8t - 5$

$\int dV = \int (8t - 5)\, dt$

$V = \frac{8t^2}{2} - 5t + c$

$V_0 = 12 \quad t = 0$

$C = 12$

$\boxed{V = 4t^2 - 5t + 12}$

at $t = 10 \Rightarrow V = \checkmark\ m/s$

$V = \frac{dX}{dt}$

$\frac{dX}{dt} = 4t^2 - 5t + 12$

$\int dX = \int (4t^2 - 5t + 12)\, dt$

$X = \frac{4}{3}t^3 - \frac{5}{2}t^2 + 12t + C$

$X_0 = 2 \quad t = 0$

$C = 2$

$\boxed{X = \frac{4}{3}t^3 - \frac{5}{2}t^2 + 12t + 2}$

at $t = 10 \Rightarrow X = \checkmark\ m$

EX 5 :-

$f = -(a + bV^2)$

$V = 0 \xrightarrow{\text{Prove}} X = \frac{1}{2b} \ln\left(1 + \frac{b V_0^2}{a}\right)$

Sol

$f = V \cdot \frac{dV}{X}$

$V \cdot \frac{dV}{dX} = -(a + bV^2)$

$\frac{1}{2b} \int \frac{2bV \cdot dV}{a + bV^2} = -\int dX$

$\frac{1}{2b} \ln(a + bV^2) = -X + C$

$V_0 r,\ X = 0\ ,\ t = 0$

$C = \frac{1}{2b} \ln\left(a + bV_0^2\right)$

$X = \frac{1}{2b} \ln(a + bV_0^2) - \frac{1}{2b} \ln(a + bV^2)$

$X = \frac{1}{2b} \ln \frac{a + bV_0^2}{a + bV^2}$ at $V = 0$

$X = \frac{1}{2b} \ln\left(1 + \frac{bV_0^2}{a}\right)$ ###

EX 1:-

$$x^2 + ax + b$$
$$\left(x + \frac{a}{2}\right)^2 + b - \left(\frac{a}{2}\right)$$

$V_0 = 30\sqrt{2}$ m/s

$f = (6 + .02x)$ m/s²

$t = ??$ $\longrightarrow x = 55$ m

Sol

$F \; v \cdot \frac{dv}{dt}$

$F = \frac{dv}{dt}$

$$V = \frac{dx}{dt}$$

$$f = v \cdot \frac{dv}{dx}$$

$$\int v\,dv = \int f\,dx$$

$$\frac{1}{2}v^2 = 6x + \frac{.02}{2}x^2 + C$$

$V_0 = 30\sqrt{2}$ $x = 55$

$$C = 900$$

$$V^2 = .02x^2 + 12x + 1800$$

$$V = (.02x^2 + 12x + 1800)^{\frac{1}{2}}$$

$$\frac{dx}{dt} = (.02x^2 + 12x + 1800)^{\frac{1}{2}}$$

$$\int \frac{dx}{\sqrt{.02x^2 + 12x + 1800}} = \int dt$$

$$\int \frac{dx}{\sqrt{x^2 + 600x + 90000}} = \int \sqrt{.02}$$

$$\int \frac{dx}{\sqrt{(x + 300)^2}} = \int \sqrt{.02}\,dt$$

$$\int \frac{dx}{x + 300} = \int \sqrt{.02}\,dt$$

$$\ln(x + 300) = \sqrt{.02}\,t + C$$

$t = 0, \; x = 0$

$$C = \ln(300)$$

$$\ln(x + 300) = \sqrt{.02}\,t + \ln 300$$

$$\sqrt{.02}\,t = \ln\frac{x + 300}{300}$$

$$t = \frac{1}{\sqrt{.02}} \ln\frac{x + 300}{300} \quad \#$$